

# Loan Sales and Bank Liquidity Risk Management: Evidence from a U.S. Credit Register<sup>1</sup>

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<sup>1</sup>The views expressed here are those of the author and do not necessarily reflect the views of the Board of Governors or staff of the Federal Reserve System.

# Motivation

- ▶ Financial institutions buy and sell commercial loans after origination (i.e., in a loan secondary market)
- ▶ This secondary market has grown rapidly since 2000 and trading continued during the financial crisis (Gande and Saunders, 2012)
- ▶ However, limited empirical evidence on this market...
  - Which institutions are involved?
  - What are the causes and consequences of a loan trade?
  - How does this market behave under stress?

# Literature

- ▶ Existing evidence on loan sales and bank risk management
  - Theory of credit risk transfer, regulatory capital constraints, and contracting frictions (Pennacchi 1988; Gorton and Pennacchi, 1995; Parlour and Winton, 2013)
  - Limited empirical results (data from one bank, pre-2000, etc.)
- ▶ Recent literature highlights liquidity risk management
  - Kashyap, Rajan, Stein, 2001; Acharya, Almeida, Campello, 2013; Cornett et al, 2011; Bord and Santos, 2014
  - Has not been studied in the context of loan sales

# Our Contribution

- ▶ We study secondary market loan share sales during 2003–2010 from a **bank risk management perspective**
  - Comprehensive regulatory data on U.S. banks' syndicated loan share holdings → secondary market transactions
  - Identify bank-level determinants of loan sales
  - Highlight important role of bank liquidity risk management

# Our Contribution

- ▶ We study secondary market loan share sales during 2003–2010 from a **bank risk management perspective**
  - Comprehensive regulatory data on U.S. banks' syndicated loan share holdings → secondary market transactions
  - Identify bank-level determinants of loan sales
  - Highlight important role of bank liquidity risk management
- ▶ We find banks more dependent on wholesale funding were
  1. Less likely to sell loans before the crisis
  2. More likely to sell loans during the crisis
  3. More likely to sell relatively liquid bank loans during the crisis

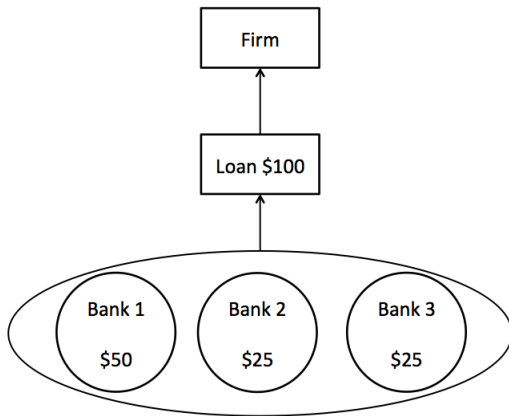
# Data

## Shared National Credit Program (est. 1977)

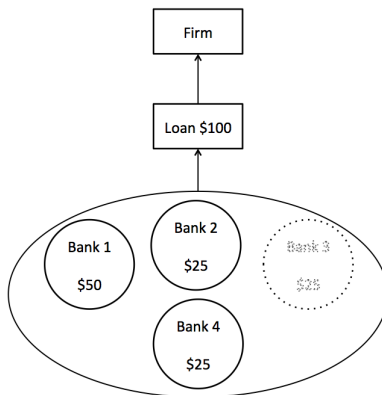
- ▶ Annual examination of syndicated loan holding as of December 31 by Fed, FDIC and OCC
- ▶ All syndicated commercial loans with
  1. Loan package  $\geq$  \$20 million
  2. Shared by at least 3 supervised institutions

⇒ Complete register of loan share holdings post origination

## Loan Share Sale: Syndicate in $t$



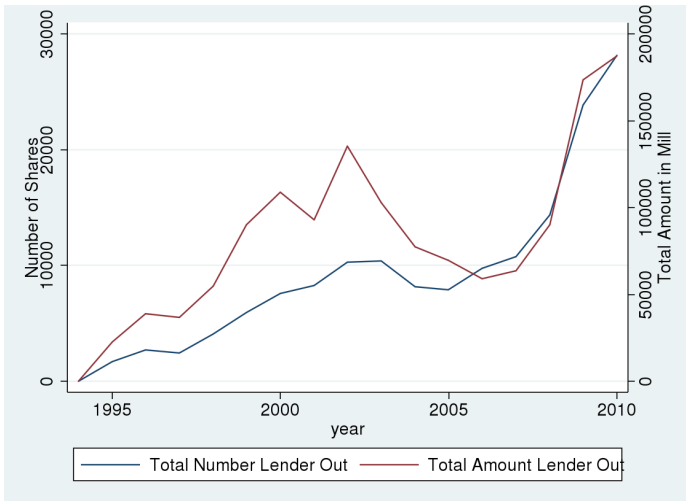
## Loan Share Sale: Syndicate in $t + 1$



Loan share sale in  $t + 1$ : Lender owned share in  $t$  but not in  $t + 1$   
(and loan doesn't mature in  $t + 1$ )



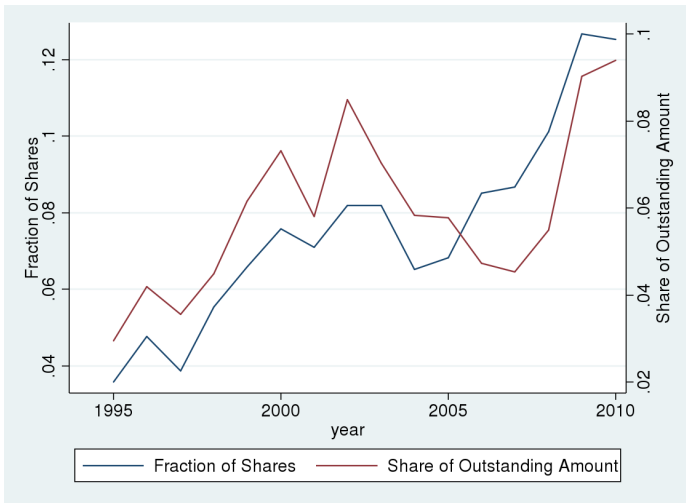
# Loan Shares Sold by BHCs



- U.S. top holders (no within organization sales); excludes bank mergers

# Loan Shares Sold by BHCs

(% of total SNC loan commitments outstanding)



# Liquidity Risk: Theory and Measurement

## ► Idea

- In normal times, banks could use wholesale funding markets to improve flexibility → increases vulnerability to market-wide liquidity shocks
- When such shocks realize, banks could use loan sales to improve their liquidity positions

## ► Measure wholesale funding dependence relative to assets

- Wholesale funding is the sum of large time deposits, foreign deposits, repo sold, other borrowed money, subordinated debt, and fed funds purchased
- Complement of core deposits ratio

# Identification

- ▶ Suppose observe wholesale funded banks sold more loan shares during the financial crisis...
- ▶ Key identification challenges
  1. Omitted variables bias
    - Fix wholesale funding at onset of crisis
    - Control for bank equity and loan losses
  2. Separating supply from demand

# Identification: Separating Supply and Demand

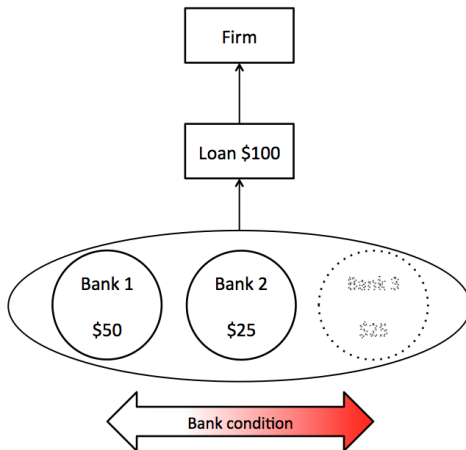
Problem: Did the bank sell loan share because...

- ▶ Bank experienced liquidity shortage?
- ▶ Or, borrower condition deteriorated?

Solution

- ▶ **Loan-year fixed effects** (e.g., Khwaja and Mian, 2008)
- ▶ Examine propensity to sell loan shares across banks as function of bank condition, *for a given loan syndicate*

# Loan Fixed Effects Approach



- Focus on **within syndicate-year variation**: Fix syndicate and compare exit rate between banks

# Baseline Specification

$$\text{Loan Sale}_{ijt} = c_{it} + \alpha \cdot \text{Wholesale Funding}_{j,200XQ4} + \beta \cdot X_{j,t-1} + \epsilon_{ijt}$$

►  $\text{Loan Sale}_{ijt}$

= 1 bank  $j$  exited loan syndicate  $i$  between  $t - 1 \rightarrow t$

= 0 otherwise

►  $X_{j,t-1}$

- Bank-level variables that may also influence loan sales
- Log(assets), real estate loan share, equity capital ratio, non-performing loan ratio, net charge-offs, large bank indicator, merger indicator, agent indicator, and loan fraction held
- U.S. BHCs only  $\rightarrow$  balance sheet variables from Y9-C

## Pre-Crisis 2003–2006

$$\text{Loan Sale}_{ijt} = c_{it} + \alpha \cdot \text{Wholesale Funding}_{j,2002Q4} + \beta \cdot X_{j,t-1} + \epsilon_{ijt}$$

	All [1]
Wholesale Funding <sub>2002Q4</sub>	-0.035*** (0.015)
Controls	yes
Loan-Year fixed effects	yes
N	66,267
# Loans	9,612
R <sup>2</sup>	0.36

- Banks may have tapped wholesale funding to fund loans



## Crisis 2007–2010

$$\text{Loan Sale}_{ijt} = c_{it} + \alpha \cdot \text{Wholesale Funding}_{j,2006Q4} + \beta \cdot X_{j,t-1} + \epsilon_{ijt}$$

	All [1]
Wholesale Funding <sub>2006Q4</sub>	0.076*** (0.014)
Controls	yes
Loan-Year fixed effects	yes
N	76,621
# Loans	9,564
R <sup>2</sup>	0.42

- Wholesale funding dependence at onset of crisis → loan sales

# Economic Interpretation

- ▶ Unconditional probability of loan share sale
  - 6.6% (2003–06)
  - 9.5% (2007–10) ... 2.9 percentage point increase
- ▶  $1\sigma$   $\uparrow$  wholesale funding dependence (0.14) increases the probability of loan share sale by 1.1 percentage points
- ▶  $\approx 38\%$  of increase in the unconditional probability of loan share sale

## Crisis 2007–2010: Robustness I

$$\text{Loan Sale}_{ijt} = c_{it} + \alpha \cdot \text{Wholesale Funding}_{j,2006Q4} + \beta \cdot X_{j,t-1} + \epsilon_{ijt}$$

	All [1]	<250 Lenders [2]	No Amend [3]	2006 Avg. [4]	Dynamic Spec. [5]
Wholesale Funding <sub>2006Q4</sub>	0.076*** (0.014)	0.077*** (0.014)	0.066*** (0.015)	0.057** (0.014)	0.103*** (0.014)
Controls	yes	yes	yes	yes	yes
Loan-Year fixed effects	yes	yes	yes	yes	yes
N	76,621	73,045	46,210	76,625	81,011
# Loans	9,564	9,301	7,409	9,564	9,599
R <sup>2</sup>	0.42	0.41	0.43	0.42	0.41

## Robustness II

1. Split by industry
  - Positive effect of wholesale funding dependence on loan sales present in all industry subgroups
2. Split by credit quality
  - No difference between criticized and not criticized loans
3. Allow for nonlinear effect of wholesale dependence
  - Coefficient on high dependency dummy (top p25) implies a 1.5 percentage points increase in the propensity to sell
4. Controlling for bank solvency
  - Various book measures, TARP, MVE/Assets, growth in MVE
5. Freeze all bank variables (2006Q4)
6. Bank fixed effects specification

# Role of Loan Market Liquidity

- ▶ Which loans do banks choose to sell?
  - Sell liquid loans to minimize potential discount
  - Keep liquidity cushion against future liquidity needs
  
- ▶ Measuring **secondary market depth**
  1. Credit lines vs term loans
  2. Small vs large loans
  3. Non-securitized vs securitized loans
  4. Loans with small syndicates vs loans with large syndicates

# Role of Loan Market Liquidity

$$\text{Loan Sale}_{ijt} = c_{it} + \alpha \cdot \text{Wholesale Funding}_{j,2006Q4} + \beta \cdot X_{j,t-1} + \epsilon_{ijt}$$

	Credit Lines [1]	Term Loans [2]
Wholesale Funding <sub>2006Q4</sub>	0.058*** (0.015)	0.077*** (0.027)
Controls	yes	yes
Loan-Year fixed effects	yes	yes
N	48,227	28,394
# Loans	5,795	4,564
R <sup>2</sup>	0.36	0.43

- Similarly, banks sold: large loans, securitized loans, and loans with large syndicates

# Additional Supportive Evidence

1. Banks with **other liquid assets** should be less likely to sell
  - ▶ Liquid Assets = cash, repos bought, fed funds sold, and securities (excluding MBS/ABS) divided by total assets

## Role of other liquid assets

	All [1]	All [2]	All [3]
Wholesale Funding <sub>2006Q4</sub>	0.076*** (0.014)	0.101*** (0.014)	0.158*** (0.029)
Liquid Assets <sub>2006Q4</sub>		-0.053*** (0.020)	0.042 (0.052)
Wholesale Funding <sub>2006Q4</sub> * Liquid Assets <sub>2006Q4</sub>			-0.217*** (0.095)
Controls	yes	yes	yes
Loan-Year fixed effects	yes	yes	yes
N	76,621	76,621	76,621
# Loans	9,564	9,564	9,564
R <sup>2</sup>	0.42	0.42	0.42

- Cash-rich, wholesale dependent banks less likely to sell loans



## Additional Supportive Evidence (cont.)

1. Banks with other liquid assets should be less likely to sell
2. Effect should be stronger in **years with tighter funding conditions**

## Year-by-Year Estimates

$$\text{Loan Sale}_{ijt} = c_{it} + \alpha \cdot \text{Wholesale Funding}_{j,2006Q4} + \beta \cdot X_{j,t-1} + \epsilon_{ijt}$$

	All [1]	2007 [2]	2008 [3]	2009 [4]	2010 [5]
Wholesale Funding <sub>2006Q4</sub>	0.101*** (0.014)	0.081** (0.019)	0.299*** (0.038)	0.047 (0.035)	0.056 (0.040)
Controls (inc. cash)	yes	yes	yes	yes	yes
Loan-Year fixed effects	yes	yes	yes	yes	yes
N	76,621	19,856	16,895	23,051	16,819
# Loans	9,564	4,893	4,558	5,634	3,790
R <sup>2</sup>	0.42	0.38	0.42	0.42	0.45

- Effect strongest in 2007 and 2008, prior to government intervention

## Additional Supportive Evidence (cont.)

1. Banks with other liquid assets should be less likely to sell
2. Effect should be stronger in years with tighter funding conditions
3. Secondary market **purchases**
  - ▶ Banks were net buyers of loan shares before crisis
  - ▶ Banks were net sellers of loan shares during crisis
  - ▶ On average, buyers had higher wholesale funding before crisis
  - ▶ On average, buyers had lower wholesale funding during crisis
  - ▶ Wholesale funding difference (buyers - sellers) greatest in 2008

# Conclusion

- ▶ We study secondary market loan share transactions during 2003–2010
  - Comprehensive regulatory share ownership data
  - We take a bank risk management perspective
- ▶ We show: market-wide liquidity shock → wholesale funded banks sold more loan shares
  - Banks sold liquid loans
  - We argue that banks sold loans to preserve liquidity during the financial crisis